Evolution of physical performance and handgrip strength in elderly assisted by an Interdisciplinary Domiciliary Assistance Program during one year

Evolução de desempenho físico e força de preensão palmar em idosos assistidos por um programa de assistência domiciliar interdisciplinar em um ano

Evolución de desempeño físico y fuerza de prensión palmar en adultos mayores acompañados por un programa de asistencia domiciliar interdisciplinar de un año

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ABSTRACT | Due to the increase of morbidities in aging, there is a need for health services to assist elderly, such as a Domiciliary Assistance. We performed an observational prospective study to analyze physical performance and handgrip strength in elderly assisted by Interdisciplinary Domiciliary Assistance Center in one year. We assessed 19 elderly who were capable of comprehension, independent gait and without decompensation of disease at baseline and after one year. The evaluation consisted of anthropometric and clinical data collected by medical records, physical performance (Short Physical Performance Battery-SPPB) and handgrip strength at patient home. We compared the evaluations (paired t test) and assess the association between body mass index, age, SPPB and handgrip strength (Pearson correlation). As results, there was a significant worsening in handgrip strength in both limbs, gait speed and general physical performance. Body mass index, balance and lower extremity strength were kept. We observed inverse correlation between age (r=-0.55) and change in balance and direct correlation between handgrip strength and gait (r=0.48). There was no other significant correlation. A more specific and frequent assistance could bring benefits on independence and quality of life in elderly community, since elderly get higher functional loss and comorbidities.

Keywords | home nursing; patient care team; aged; geriatric assessment

RESUMO | Com o aumento de morbidades no envelhecimento, há necessidade de serviços de saúde que prestem assistência aos idosos, como o atendimento domiciliar. Com o objetivo de analisar o desempenho físico e a força de preensão palmar (FPP) em idosos atendidos pelo Núcleo de Assistência Domiciliar Interdisciplinar, 19 idosos com capacidade de compreensão, independentes para marcha e sem descompensação de doença foram avaliados e reavaliados após um ano. A avaliação consistiu na coleta de dados clínicos e antropométricos nos registros de prontuários e desempenho físico (*Short Physical Performance Battery*-SPPB) e força de preensão palmar no domicílio do paciente. Compararam-se as avaliações (teste t pareado) e verificou-se associação entre índice de massa corporal (IMC), idade, SPPB e FPP (correlação de Pearson). Em um ano, houve piora significativa na FPP nos dois membros, velocidade de marcha e desempenho físico geral. O IMC, equilíbrio e força de membros inferiores (FMI) foram

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mantidos. Correlação inversa foi observada entre idade e variação de equilíbrio (r=-0,55) e direta entre FPP e marcha (r=0,48). As outras variáveis não apresentaram correlação significativa. Uma assistência mais específica e frequente traria benefícios para a independência e qualidade de vida dessa população, uma vez que os idosos têm elevada perda funcional e comorbidades.

Descritores | assistência domiciliar; equipe de assistência ao paciente; idoso; avaliação geriátrica.

RESUMEN | Con el aumento de morbilidades en el envejecimiento, existe la necesidad de que servicios de salud presten asistencia a los adultos mayores, tal como la atención domiciliaria. Con el objetivo de analizar el desempeño físico y la fuerza de prensión palmar (FPP) en adultos mayores atendidos por el Núcleo de Asistencia Domiciliar Interdisciplinar, 19 adultos mayores con capacidad de comprensión, independientes para la marcha y sin descompensación de enfermedades fueron evaluados y reevaluados después de un año. La evaluación consistió en recopilar información de datos clínicos y antropométricos en las fichas clínicas. La evaluación del desempeño físico (*Short Physical Performance Battery*-SPPB) y fuerza de prensión palmar en el domicilio del paciente. Se compararon las evaluaciones (test *t* pareado) y se verificó asociación entre índice de masa corporal (IMC), edad, SPPB y FPP (correlación de Pearson). En un año, empeoraron significativamente en la FPP de los dos miembros, velocidad de marcha y desempeño físico general. El IMC, equilibrio y fuerza de miembros inferiores (FMI) fueron mantenidos. Una correlación inversa fue observada entre la edad y la variación del equilibrio (r=-0,55) y directa entre FPP y marcha (r=0,48). Las otras variables no presentaron correlación significativa. Una asistencia más específica y frecuente traería beneficios en la independencia y calidad de vida de esta población, debido a que los adultos mayores tienen una elevada pérdida funcional y comorbilidades.

Palabras clave | asistencia domiciliar; equipo de asistencia al paciente; adulto mayor; evaluación geriátrica.

INTRODUCTION

In the phase of demographic and epidemiologic transitions, care alternatives to an increasing number of elderly people are sought, especially in developing countries, where the aging process unravels faster[1]. Considering that the family has a prominent role in caring and creating an environment that is favorable to the recovery of elderly people[2], home assistance is an option. Interdisciplinary care seems fundamental, given that elderly people are at an increased risk of health and functional decay[3].

Functionality assessments, which include mobility, balance, and strength, have been carried out to predict the risk of dependence of elderly people[4]. One of the most used method is the *Short Physical Performance Battery* (SPPB) which, in addition to having a good intra and inter-examining reliability and fast application[5], also predicts the risk of institutionalization, need for support, functional decline, and mortality[6,7]. SPPB can be complemented by the assessment of handgrip strength (HGS)[4], and it is related to global muscle strength, dependence, and mortality in elderly people[8,9].

Few studies have evaluated the functional evolution of elderly people under interdisciplinary home assistance for a prolonged period of time. In the study by Alencar et al.[10], in Brazil, preventive guidelines as well as balance, mobility, and gait training for individuals aged between 29 and 96 years, out of which 78.6% were aged over 60 years, and did not present improvement in functionality after 30 to 40 days were provided. In the study by Vass et al.[11], in Denmark, the effects of an educational interdisciplinary program during home visits during the course of 3 years were evaluated, and a reduction of functional decline and admission into long-stay institutions in 90 elderly people of advanced age were verified.

The disagreement among earlier studies along with the necessity of expanding home assistance programs in Brazil require a deeper knowledge about the analysis of functional performance in patients cared for by interdisciplinary home assistance teams. In light of this, the aim of this observational study was to analyze the physical performance and the HGS of elderly people assisted by the Núcleo de Assistência Domiciliar Interdisciplinar (Interdisciplinary Home Assistance Center – NADI) of the Clinics Hospital of the São Paulo University, Faculty of Medicine (HC-FMUSP) during the course of 1 year. The study hypothesis was that there would be functionality stabilization during that year because of the interdisciplinary approach, which propitiates greater benefits to elderly people, and a more encompassing view of the patient.

METHODOLOGY

This study was observational and longitudinal. The inclusion criteria were: being 60 years of age or older, comprehension capacity evaluated through medical chart records and/or information obtained by discussing the case with the team, ability to walk inde-

pendently (with or without auxiliary devices), and absence of acute or decompensated diseases. In this way, 30 of the 142 patients assisted by NADI up to November 2010 were selected.

NADI has the purpose of assisting patients admitted into the HC-FMUSP who require home assistance, due to the type of illness, decline of clinical situation or inability to go to the hospital. The team is composed of doctors, social workers, nurses, physiotherapists, dentists, nutritionists, psychologists, and pharmacists, and whenever it is necessary, dentists and pharmacists are requested at specific homes. Before and after the home visits, team meetings are conducted to study the measures, guidelines, and referrals to each patient scheduled. The team guides and directs responsibility for care toward the patient, the family, and the caregiver, since weekly visits to each home are impossible.

NADI makes its professionals available from 8 a.m. to 6 p.m. on weekdays to receive telephone calls and questions from caregivers and patients, who enquire about or report clinical complications, medication handling, and guidelines given by the team, or request another type of assistance. In case the problem is not solved over the phone, the team verifies the necessity of a visit beforehand, and determines which professionals are required to solve the immediate problem. Medication and the material used in care are provided by the hospital. The program is linked to the hospital, thus propitiating the conduction of necessary procedures, both in the medical center and during hospitalization. Physiotherapy assistance is individualized and performed according to the objectives of the team. The interval between home visits varies according to the complexity and need of the patient and/or the caregiver.

To the elderly people in the study, physiotherapy orientation was given in relation to transfers (correction and adaptation of activities to avoid deformities and overload both to the patient and the caregiver), moving (correct use of walking devices, stimulus to walking safely in different environments), correct posture to avoid deformities, functional exercises, adaptations at home, and other orientations related to the patient's and the caregiver's improvement of life quality. Given that the volunteers presented the ability to understand, the guidelines were preferably passed on to the elderly people and emphasized to the caregivers through the use of instruction books, if it was necessary.

The volunteers were assessed before and after 1 year. Before the first assessment and between both, the patients were assisted in accordance with NADI's routine – one monthly visit on average. The evaluation consisted of the collection of sociodemographic and clinical data [name, age, sex, comorbidities, use of support devices, and body mass index (BMI)] by means of medical chart records, SPPB battery[5], and HGS at the patients' home.

The SPPB assesses three performance areas: static balance, gait speed, and lower limb strength (LLS). Each domain varies between 0 and 4 points, and the maximum total score indicates better physical performance. The individuals are classified as dependent (0 to 3 points), or as having low (4 to 6 points), moderate (7 to 9 points), or good performance (10 to 12 points).

To measure HGS, we used a manual hydraulic dynamometer *SAEHAN*®, model SH5001, in accordance with the *American Association of Hand Therapists'* protocol[12]. The patient was instructed to remain seated on a chair with the shoulders in neutral position, elbow at a flexion of 90°, and forearm in neutral position. The dynamometer stem was adjusted according to the size of the hand. An average of three attempts for each hand was used.

This study was approved by the HC-FMUSP Ethics Committee for the Analysis of Research Projects (protocol 0553/11). All volunteers signed the Free and Informed Consent Form.

The descriptive analysis of data was performed. For the comparison between the initial and final evaluations, after the analysis of data distribution, the paired t test for the variables HGS, BMI, SPPB (balance), SPPB (gait), SPPB (strength), and SPPB (total) was used. Pearson's Correlation analyzed the associations among BMI (initial-final difference), age, SPPB (initial-final difference), and HGS (initial-final difference). The significance level was settled at 5%. The data were analyzed by the software Sigma Stat, version 4.0.

RESULTS

Of the 30 elderly people included, 19 (aged between 72 and 94 years) completed the study. Eleven were not re-assessed due to death (n=8), discharge from the NADI (n=1), hospitalization (n=1), or the team's difficulty in visiting the patient's home within the determined time frame (n=1). The interval between the assessments was 416.58±46.05 days. Table 1 shows the

sociodemographic and clinical data of the patients who underwent both evaluations.

The difference in the median of the right HGS between the initial and the final assessment was -2.34 kg ($p<0.05$), with an interval of -20.34 to 2.33 kg. With regard to the left HGS, there was a difference of -2.67 kg in the median between the evaluations, with an interval of -10.67 to 4 kg. The initial and final BMI were similar (Table 2).

The SPPB was analyzed separately in relation to the performances, in addition to the total analysis. There was no difference between the initial and the final SPPB (balance and strength). In the SPPB (gait), the median difference between the evaluations was 0, with an interval of -2 to 0. The final values were lower than the initial ones ($p=0.016$). In the SPPB (total), the difference between the assessments varied from -4 to 2, with an average of -0.84, and standard deviation of 1.64. The SPPB (total) worsened as time went by ($p=0.038$) (Table 3).

Through the use of the SPPB for the initial evaluation, the patients were classified as dependent (n=7), low performance (n=8), and moderate performance (n=4). In the final assessment, they were classified as dependent (n=12), low performance (n=6), and moderate performance (n=1).

We observed a moderate correlation between age and the SPPB (balance): the older the patient, the lower the SPPB (balance) variation ($r=-0.551$; $p=0.0145$). This information is justified, since aging promotes the progressive decline of motor capacities, including balance. Bad initial scores that remained the same in the final evaluations were observed in these cases. There was positive correlation between the HGS (right) and the SPPB (walk) ($r=0.482$; $p=0.0367$).

Table 1. Sociodemographic and clinical data of the 19 elderly people who completed the study

	n (%)	Average±SD
Age (years)	-	83.84±6.38
Sex		
Male	6 (31.57)	-
Female	13 (68.43)	-
Illnesses		
Cardiovascular	18 (94.73)	-
Neurological	11 (57.89)	-
Osteo/joint disease	7 (36.84)	-
Endocrine/metabolic	5 (26.31)	-
Pulmonary	2 (10.52)	-
Gastrointestinal	4 (21.05)	-
Neoplasia	2 (10.52)	-
Psychiatric	5 (26.31)	-
Gynecologic	3 (15.78)	-
Sensorial	6 (31.57)	-
Number of illnesses	-	6.36±2.56
0-4	4 (21.05)	-
>5	15 (74.94)	-
Use of Support Device		
Cane	6 (31.58)	-
Walker	5 (26.32)	-
None	8 (42.10)	-

SD: standard deviation

Table 2. Comparison between the evaluation of handgrip strength and body mass index, before and after 1 year, of the 19 elderly people who completed the study

	Average±SD	p-value
HGS (right)		
I-as	19.26±8.01	0.002*
F-as	15.80±9.39	
HGS (left)		
I-as	16.74±7.75	0.003*
F-as	13.91±6.90	
BMI		
I-as	23.76±4.82	0.855
F-as	25.64±4.36	

*p<0.05; BMI: body mass index; F-as: final assessment; HGS: handgrip strength; I-as: initial assessment; SD: standard deviation

DISCUSSION

In the course of 1 year, the elderly people, even under interdisciplinary home assistance, presented loss of global muscle strength, gait speed, and decline in general physical performance. We also verified that the progression of balance loss is associated with age, and the decrease in gait speed is related to the loss of muscle strength.

According to a study conducted by Rantanen et al., that involved elderly people with an average age of 75 years, there is a loss of 1% in HGS per year, with the possibility of reaching 1.5% in men and 0.85% in older women, and the weight and age are determining factors of

Table 3. Comparison between the SPPB assessments before and after one year in 19 elderly people

	Average±SD	p-value
SPPB (balance)		
I-as	2±0.82	0.695
F-as	1.9±1.15	
SPPB (gait)		
I-as	1.53±0.77	0.016*
F-as	1.05±0.23	
SPPB (strength)		
I-as	0.84±0.83	0.094
F-as	0.53±0.61	
SPPB (total)		
I-as	4.37±1.92	0.038*
F-as	3.53±1.74	

*p<0.05; F-as: final assessment; I-as: initial assessment; SD: standard deviation; SPPB: Short Physical Performance Battery

such loss[13]. The loss of muscle strength is more accentuated and faster in patients aged over 80 years, with the potential of being 50% higher in women in comparison to men[9]. The patients presented a significant loss of strength, on average 18% in 1 year, probably because the population was older, 83.84 years on average, most of them women, and because the measurement methods were different.

Although the HGS was reduced, there was no change in LLS, and in balance. The population already presented a low performance in the initial assessment; therefore the tests might not have detected such losses.

Despite the differences found in some variables between the evaluations, we observed an overall stabilization in physical performance. Considering that this was an older and more fragile population, with multiple co-morbidities, such stabilization might not be considered bad in the course of 1 year; on the contrary, it might even be a satisfactory result. The modifications brought by aging[14] could be slowed down if these elderly people were assisted with an increase in purposeful and specific exercises more frequently, that is, with more visits it would be possible to reassess the patients and expand the exercises and orientations according to their progress and need. As a result of safety reasons, the increase in exercise was only possible after a physiotherapy assessment.

In a study by Ashworth et al.[15], the efficiency of home and clinic exercises for long-lived elderly patients were revised, and observed that, on a short-term span, the clinic programs had better training effects. On a long-term basis, however, home exercises presented better results and higher adhesion.

NADI postulates the re-establishment of the patient's and the caregiver's health and life quality. Unfortunately, in its routine, there is a shortage of physiotherapists and difficulty in visiting patients more frequently — one monthly visit on average — due to a high demand and small number of professionals, which can interfere in the adhesion to the program. Another important factor that must be considered is that these visits were not always physiotherapy-focused, and the priority of care was defined according to the patient's clinical situation and the relatives' needs.

The study by Taekema et al.[8], verified that HGS was significantly associated with the functionality and gait speed of 555 elderly people aged over 85 years, both in the initial evaluation and after 1 year. The same association was verified between HGS and gait in this present study. One of the hypotheses raised for the impact of the muscle weakness of upper limbs on gait speed would be that, since more than half of the population studied used support devices (walkers and canes), the decrease in the strength of the upper limbs, used for handling the devices, could affect gait speed and performance. The study by Haber et al.[16], verified a non-linear significant relation between age and LLS, speed and duration of double support in gait and balance in 212 women from the community who were aged between 21 and 82 years. More research is necessary to optimize interventions that reduce the risk of falls and fractures, and maintain functionality of elderly people.

In the study by Gill et al.[17], the effects of physical exercises performed at home in 188 fragile elderly people who were aged 83 years old on an average were studied. The intervention group was submitted to training with a walking support device, exercises for strengthening, balance, and environmental adaptation during 16 visits for six months. The control group was submitted to lectures with a multi-professional team. The patients were accompanied over the phone, during 3, 7, and 12 months after the intervention. The intervention group was less deficient in balance, muscle strength, and mobility in comparison to the control group in 3, 6, and 12 months, especially the less fragile individuals. Therefore, functional decline might be delayed in fragile elderly people with the aid of home programs consisting of simple and short exercises that can be regularly implemented in home assistance programs, such as NADI.

Considering the lack of Brazilian studies on interdisciplinary teams, whose view of the patient is more complete and integrated, the importance of this study resides in showing the evolution of physical performance of elderly people assisted by an interdisciplinary home assistance program during 1 year. Moreover, we focused on a more fragile and older population that requires deeper knowledge and more care in regards to health. This study has some limitations, such as the reduced sample size and losses over the year. The results obtained cannot be generalized to all elderly people in the community because they concern a specific assisted population. Although not analyzed in this study, the number and type of several illnesses found in this sample might have interfered with the elderly people's functional decay, considering that it is well-known that cardiovascular and neurologic illnesses, found in the majority of the sample observed, might interfere directly with the functional performance and during the conduction of tests and exercises proposed by

the team. In addition, there was no scale assessment of the adhesion level to the guidelines transmitted during the visits to the elderly person/caregiver and to relatives. All guidelines and information were reinforced by the team at each visit.

CONCLUSION

The elderly people in this study presented progressive loss of physical performance and handgrip strength during the course of 1 year, even though they were assisted by an interdisciplinary team at home. This fact may be related to the clinical characteristics of the population studied, such as age and multiple co-morbidities. A better infrastructure and an increase in the number of professionals that compose the team could modify these results. More studies that propose effective approaches for guaranteeing more functional and autonomous time for elderly people are necessary in the country.

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